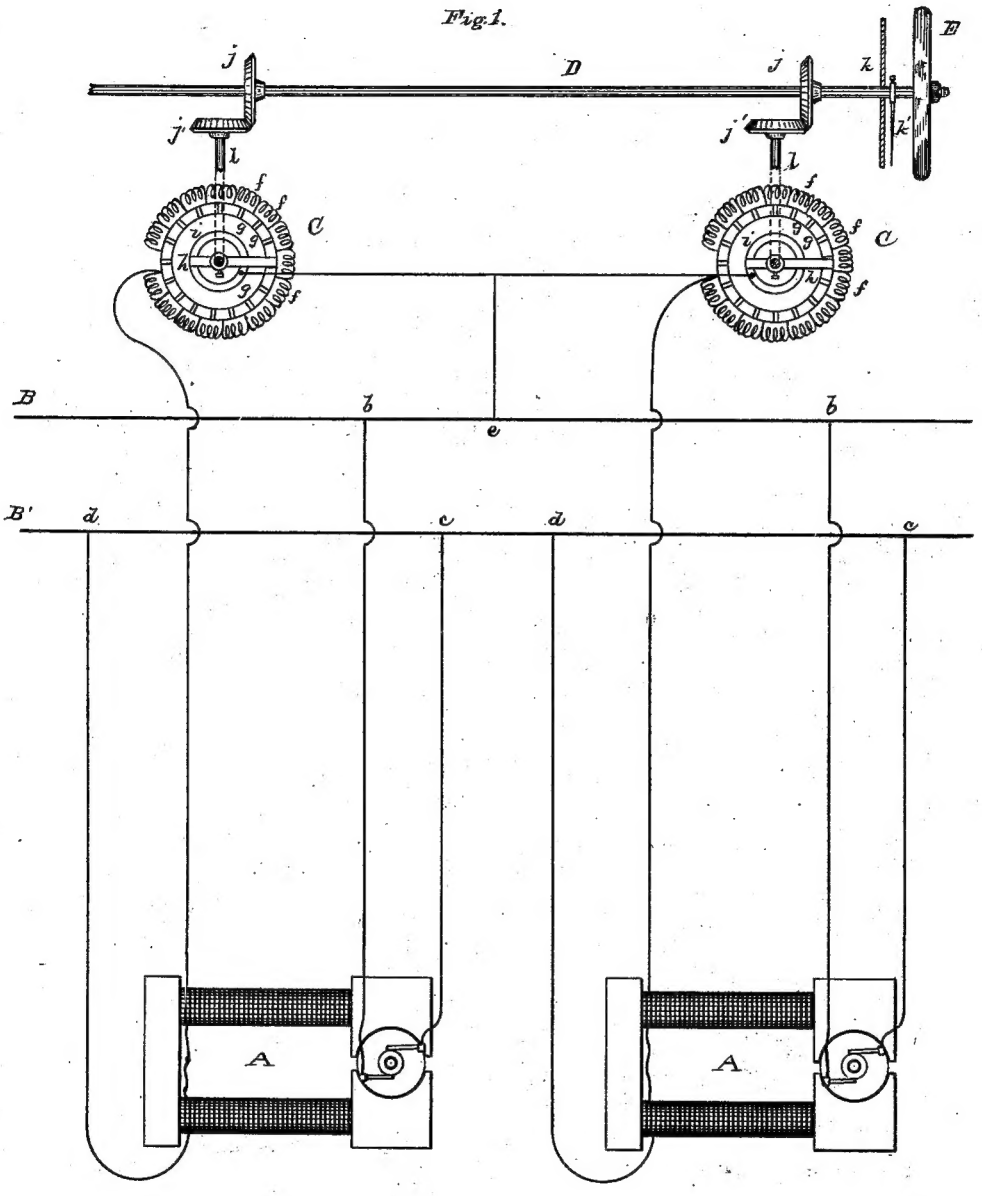
(No Model.) 2 Sheets—Sheet 1.

T. A. EDISON.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 281,349. Patented July 17, 1883.

Fig. 1.



ATTEST:

E. C. Rowland

H. W. Seely

INVENTOR:

Thomas A. Edison

By Rich'd A. Dyer

Atty

(No Model.) 2 Sheets—Sheet 2.

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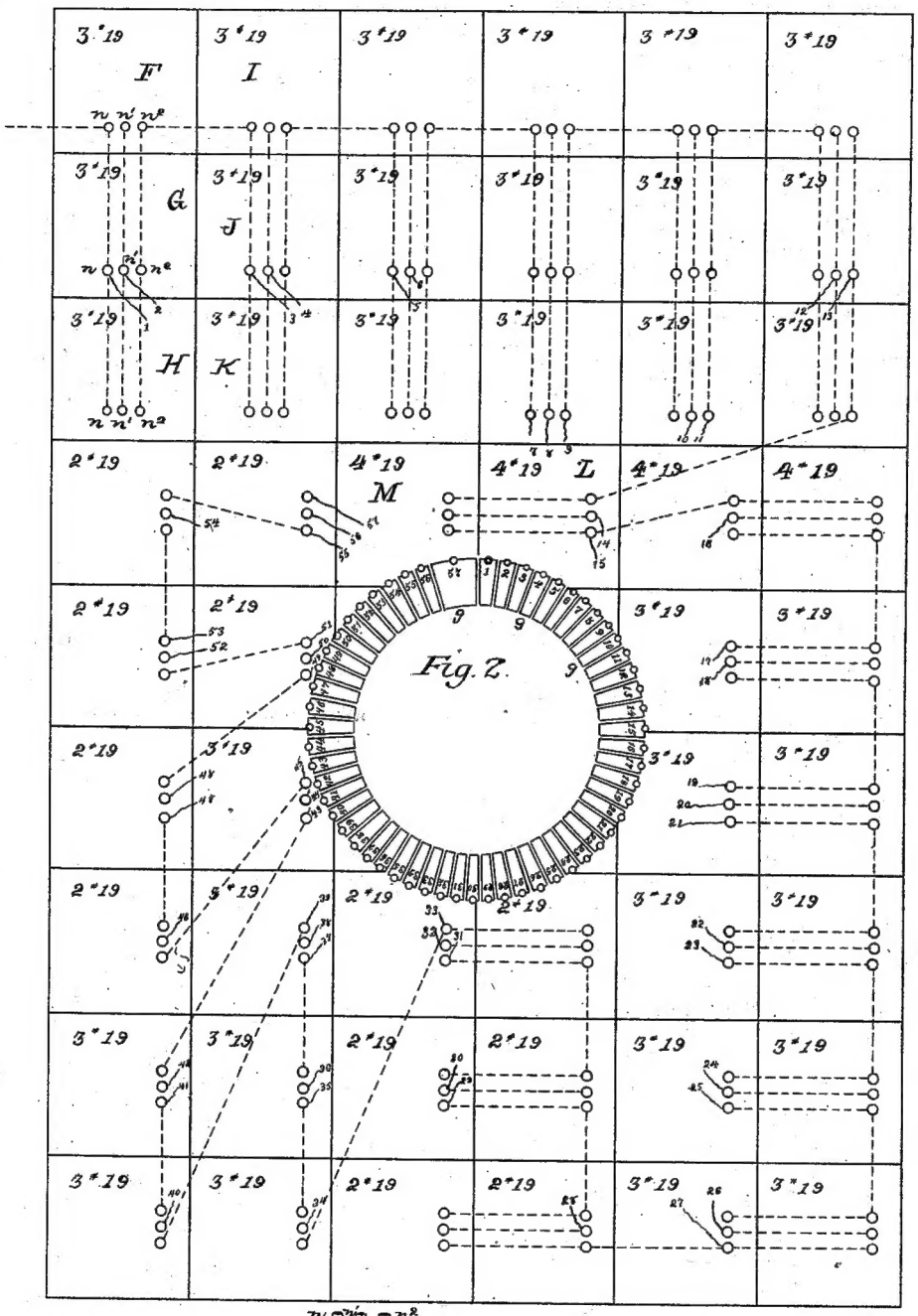

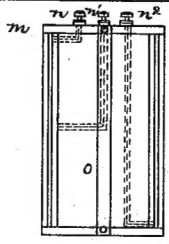

Fig. 3.

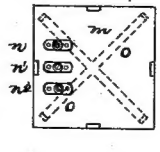

Fig. 4.

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY, ASSIGNOR TO THE EDISON ELECTRIC LIGHT COMPANY, OF NEW YORK, N. Y.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 281,349, dated July 17, 1883.

Application filed January 22, 1883. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Regulating Electric Generators, (Case No. 540,) of which the following is a specification.

My invention relates to the regulation of dynamo or magneto electric generators when a number of such generators are placed at a central station to supply current to the translating devices of a system. Each of such generators has its field-magnet coils in a circuit independent of the field-circuits of the other generators, and in each field-circuit is placed an adjustable resistance to regulate the generation of current according to the number of translating devices in circuit in the district supplied; and a portion of my invention consists in providing means whereby all such resistances may be adjusted simultaneously and to the same extent, it being necessary to do this because all such generators feed into the same circuit or system of circuits, so that all should have the same electro-motive force.

The object of the second part of my invention is to provide adjustable resistances for use in the field-circuits of the generators, which can be adjusted gradually and in the proper proportion, and shall be so formed that the conducting area of the resistance-coils shall be proportioned to the amount of current flowing in the circuit—that is, when but little resistance is placed in the circuit and a comparatively large current is passing the conducting area of the resistance thrown in will be correspondingly large, and as more resistances are thrown in and the current decreases the conducting area of such resistances will decrease correspondingly. By this means the heating of the coils is prevented, as there is always sufficient area to convey the current which passes. I accomplish this by providing a number of resistance-boxes of gradually-diminishing conducting capacity and means for successively throwing them into circuit. Such boxes preferably consist each of an insulating-frame upon which are wound wire coils. Each box is provided with three binding-posts, and the coils on said box are separately connected to all of said binding-posts, so that such coils are divided into two parts in multiple-arc relation to each other. Suitable connections are made between the boxes, as will be explained. A commutator is provided having an adjusting-arm connected in the circuit, and from each commutator-plate a wire runs to one of the binding-posts of a resistance-box. Preferably, to connect the adjusting arm in the circuit, a ring is provided, upon which said arm bears in its revolution, a wire of the circuit being connected to said ring. The connections between the boxes and from the boxes to the commutator-plates are so made that when it is first commenced to throw resistance into the circuit several coils in multiple arc will be thrown in, so that sufficient current-carrying area is provided. As more coils are thrown in the number in multiple arc with each other is lessened, until finally coils are thrown in in series one after another. To allow a still further graduation, some of the boxes are wound with two, some with three, and some with four strands of wire, and the different kinds are arranged so that they will be thrown in at the proper times.

The above will be better understood by reference to the drawings, in which Figure 1 is a view mostly in diagram, representing the resistances in the field-circuits of two generators and means for regulating them simultaneously; Fig. 2, a diagram illustrating the resistance-connections; Fig. 3, an elevation of one of the resistance-boxes, with part of the coils in dotted lines; and Fig. 4, a top view of the same.

Referring to Fig. 1, A A represent dynamo-electric machines having their armatures in multiple-arc circuits *b c* from the main circuit B B′. The field-magnets of the machines are each connected in a multiple-arc circuit, *d e*, from said main circuit. Each field-circuit contains an adjustable resistance, C, consisting of wire coils *f f*, connected to commutator-plates *g g*. A pivoted arm, *h*, makes contact with the plates *g*, and is also constantly in contact with a metal ring, *i*, which ring is connected in the circuit, a flat spring being preferably attached to the under side of said arm to in-

sure good contact. The movement of the arm *h* thus varies the resistance of the circuit. Each arm *h* is placed on a shaft, *l*, which, for convenience, is shown in dotted lines, and both shafts *l* are turned by means of bevel-gears *j j'*, the gears *j* being on a shaft, D, which is turned by a hand-wheel, E. A dial, *k*, is provided, and a pointer, *k'*, is placed on the shaft D, whereby the amount of resistance in circuit is indicated. The turning of the hand-wheel E varies the resistance of the field-circuits of both generators.

The resistance-boxes used are preferably of the form shown in Figs. 3 and 4, consisting of a wooden top, *m*, provided with three binding-posts, *n n' n²*, surrounding a frame, *o o*, (shown in dotted lines in Fig. 4,) the edges of each frame having grooves in which the coils are wound. Such coils are wound around the entire frame, and are connected to all the binding-posts, there being thus two sections of coils in multiple-arc relation to each other.

The wire used is preferably copper wire No. 19, B. W. G., and two, three, or four strands twisted together are used on the different boxes.

Fig. 2 illustrates the preferred arrangement of the boxes. The commutator-plates *g g* are numbered, respectively, from 1 to 57. Wires *p* from binding-posts *n n' n²* extend to such plates, the connections to the plates being, for convenience, shown by placing the numbers at the ends of said wires. The dotted lines indicate the connections from box to box, the connections within the respective boxes not being shown, they being made as previously explained. When the adjusting-arm rests on plate No. 1, which is connected with binding-post *n* of box G, it is evident that no resistance is in circuit, the current passing directly from binding-post *n* of box F to that of box G; but on swinging the adjusting-arm to plate No. 2, which, as indicated, is connected with post *n'* of box G, the current will pass through half the coils of each of the boxes F G H, such halves being in multiple arc to each other. Thus while resistance is placed in circuit sufficient conducting area is provided for the large amount of current which so small a resistance allows to pass. The boxes mentioned are each wound with three strands of No. 19 wire, as indicated. When plate No. 3 is connected, all the coils of boxes F G H are in circuit in multiple arc to each other. No. 4 adds half of each of the boxes I, J, and K, and this continues, half of each set of three boxes being thrown in with each successive commutator-plate until plate No. 14 is reached. The passage from plate No. 13 to No. 14 throws in in multiple arc to each other half of each of the two boxes L and M, this being done because the current has now decreased so far that the current-carrying capacity may be diminished. In order, however, that the change may be made gradual, the boxes L and M are wound, as indicated, with four instead of three strands of No. 19 wire. Beginning with plate No. 18, halves of two boxes of three strands are used, this continuing as far as plate No. 27. From plate No. 28 to No. 33, inclusive, halves of two boxes of two strands each are used. With plate No. 34 half a box of three strands is thrown in in series, and this continues to plate No. 45. With 46 to 57 half-boxes of two strands each are thrown in in series.

I do not confine myself, of course, to the particular number of plates or of boxes and coils shown, or to the especial arrangement and connections of such plates and coils. I have, however, shown an efficient arrangement for accomplishing my object—that is, to so construct an adjustable resistance that the resistances first thrown into circuit will be of comparatively great conducting capacity, while those afterward thrown in gradually decrease in this respect.

What I claim is—

1. The combination of two or more dynamo or magneto electric machines, each having its independent field-circuit, with an adjustable resistance in each of said field-circuits, and means for adjusting all of said resistances simultaneously, substantially as set forth.

2. The combination of two or more dynamo or magneto electric machines, a resistance in the field-circuit of each machine, an arm for adjusting each resistance, and means for moving all such arms simultaneously, substantially as set forth.

3. A rheostat composed of a series of resistance-boxes connected together in multiple arc and series, as described and shown, in combination with commutator-plates to which such boxes are connected, and an adjusting-arm, substantially as set forth.

This specification signed and witnessed this 13th day of January, 1883.

THOS. A. EDISON.

Witnesses:

H. W. SEELY,

EDWARD H. PYATT.